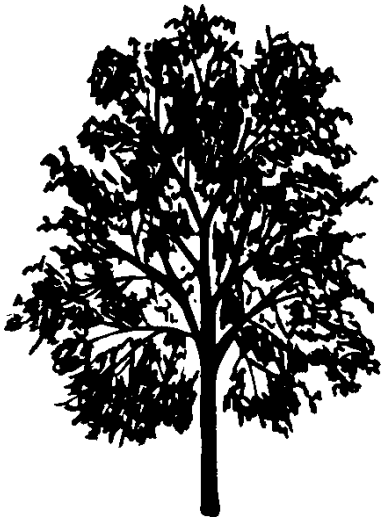
RUTGERS COOPERATIVE EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

LANDSCAPE, NURSERY & TURF EDITION $1.50 AUGUST 14, 1997



INSIDE

Foliar Nematodes in Ornamental Plants

Ann B. Gould, Ph.D., Ornamentals Plant Pathology and Richard J. Buckley, Coordinator, Plant Diagnostic Laboratory

Foliar nematodes (*Aphelenchoides* spp.) are microscopic worms that live in leaf tissue and can cause significant injury to many ornamental plants. Plants affected by foliar nematodes include a number of woody and herbaceous perennials, greenhouse stock, annual and bedding plants, and many ferns (Table 1). Due to the loss of systemic insecticides in greenhouse and nursery production, foliar nematodes are becoming much more common in New Jersey.

◆ Symptoms

In contrast to many plant parasitic nematodes that reside in the soil and feed on roots, foliar nematodes attack aerial plant parts. On young stems, leaves, and buds, external nematode feeding causes the new growth to curl, twist, and become stunted. Foliar nematodes can also penetrate plant tissue through open stomates and feed on the cells of the spongy mesophyll. As the nematodes feed and reproduce, affected tissue turns pale green, then yellow, and eventually brown. In some cases, severely affected tissue drops away, resulting in a "shot-hole" appearance.

Since foliar nematodes do not move easily through tightly packed cells or across leaf veins, affected tissues are usually bound by leaf veins. In plants with net-like veins, blighted areas often appear in an angular, "patchwork" pattern. In monocots, which have parallel veins, injured tissue appears in "stripes." Leaves infected by foliar nematodes may collapse or simply senesce prematurely. Unfortunately, some plants can be symptomless carriers of foliar nematodes, and, in many cases, nematode populations can become quite high before symptoms are expressed.

◆ Disease Development

Foliar nematodes persist during dormant periods within infected plant parts. In general, populations of foliar nematodes are low in the winter and gradually increase throughout the growing season. Symptoms are expressed by early summer and intensify as the season progresses. Foliar nematodes rarely kill the host plant, but do contribute to an overall reduction in plant vigor. In some instances, nematodes can interact with bacteria and fungi, resulting in a serious foliar blight.

Since foliar nematodes require a film of free moisture to move

SEE NEMA-

Diseases of Ornamentals

Ann B. Gould, Ph.D., Ornamentals Plant Pathology

Editor's Note: In the July 31 issue "The Diseases of Ornamentals" column as well as the "Transplant Shock in Ornamental Plantings" article were reprinted from the July 3 issue in place of the correct articles. We regret the error.

◆ China aster

Fusarium wilt is noticeable in plantings of china aster at this time. As the disease progresses, leaves become yellow, the lower leaves wilt, and the roots begin to decay. In some cases, the underground portion of the stem is coated with a pinkish mass of spores and mycelium. To manage **Fusarium wilt**, discard infected plants, prevent wounding, maintain adequate fertility, use resistant varieties, avoid extremes in soil moisture, and, if possible, replant next year in a new location. Thiophanate-methyl, applied as a soil drench, may provide some control on a preventive basis, but will not cure plants once they become infected.

Stem canker, caused by the fungus *Phomopsis*, is also troublesome on china aster. The lower stem of plants affected with **stem canker** exhibit a purple to brown discoloration. Unlike **Fusarium wilt**, however, the roots usually remain healthy. To manage **stem canker**, discard infected plants, prevent wounding, maintain adequate fertility, use resistant varieties, avoid extremes in soil moisture, and replant next year in a new location if possible. Thiophanate-methyl may provide some control (on a preventive basis) as a soil drench, but will not cure plants once they become infected. Add a spreader-sticker to improve spray coverage. ❑

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across tissue surfaces, wet conditions favor disease development. Foliar nematodes are very tolerant of desiccation, however, and can remain viable in dried plant material for years.

Foliar nematodes are spread by splashing water and in vegetatively propagated plant material. In some hosts, nematodes crawl into flowers and are disseminated on infested seed. Since some plants may act as symptomless hosts and symptoms in other plants are not apparent until nematode populations are very high, spread of this nematode can be a threat whenever new plant materials are introduced into a garden, landscape, greenhouse, or nursery.

◆ Diagnosis

Although the symptoms of foliar nematode infestations are often quite diagnostic, confirmation of the nematode in plant material must be done by laboratory analysis. Foliar nematodes are easily extracted from plant material by incubating suspect tissues in water. In a short time, the nematodes swim out of infected plant material and can be identified with a dissecting microscope. For positive diagnosis of foliar nematodes, send whole plants to the Rutgers Plant Diagnostic Laboratory and Nematode Detection Service for analysis. Refer to the Rutgers Cooperative Extension publication FS757 for more information.

◆ Management and Control

Once foliar nematodes are established in the field, control can be very difficult. The best management strategy, therefore, is to exclude infested plant material from growing areas. Use only nematode-free planting material obtained from a reputable source, and place new plants in an isolated area to monitor plants for symptom development. Clearly, plants used for propagation should remain free of nematodes and must be strictly monitored. If symptoms do develop, destroy affected plants and remove all plant debris to decrease nematode spread. Do not place infected plant material on a compost pile, since the nematode may persist and be reintroduced at a later date.

Foliar nematodes are easily killed by heat. Soaking seed or infected plant parts in hot water at a temperature of 130° to 140°F for 10 to 15 minutes should "clean up" infections. At the present time, nematicides are not readily available for foliar nematode control. Prevention and good sanitation remain the most reliable management tools. For current management recommendations, contact your local County Extension Office. ❑

Table 1. Reported hosts of foliar nematodes.[1]

Woody plants and herbaceous perennials		Greenhouse foliage, annual, and bedding plants	Ferns
Amaranthus tricolor	*Iris* sp.	*Ageratum* sp.	*Asplenium nidus*
Anemone x *hybrida*	*Ligularia* sp.	*Anthurium andraeanum*	*Athyrium goeringianum*
Baptista australis	*Ligustrum* sp.	*Begonia* sp.	*Blechnum* sp.
Begonia sp.	*Lilium* sp.	*Coleus* sp.	*Dryopteris* sp.
Fragaria x *ananassa*	*Narcissus* sp.	*Cyclamen persicum*	*Nephrolepis* sp.
Hepatica sp.	*Paeonia* sp.	*Ficus* sp.	*Polypodium* sp.
Heuchera sp.	*Papaver orientale*	*Hibiscus rosa-sinensis*	*Polystichum* sp.
Hosta sp.	*Phlox* sp.	*Impatiens* sp.	*Pteris* sp.
Hypericum sp.	*Polygonatum* sp.	*Lilium* sp.	
Ipomoea sp.	*Rhododendron* sp.	Orchids	
		Pelargonium x *hortorum*	
		Peperomia sp.	
		Saintpaulia ionantha	
		Salvia sp.	
		Sinningia sp.	
		Vanda sp.	

[1] Compiled by E.M. Dutky (University of Maryland) and A. B. Sindermann (Maryland Dept. of Agriculture).

Plant Diagnostic Laboratory Highlights

Richard J. Buckley, Coordinator, Plant Diagnostic Laboratory

◆ Turf

Anthracnose, caused by the fungus *Colletotrichum graminicola*, continues to be the most common problem on annual bluegrass and bentgrass golf greens this summer. The disease was identified on golf turf samples from Atlantic, Burlington, Cape May, and Morris counties, as well as on turf from a New York course. **Summer patch** is also still active at this time. **Summer patch** was diagnosed on golf turf from Ocean County and New York. Complexes of **senectopathic fungi** have been identified on several samples of golf turf this period. This group includes fungi such as *Curvularia*, *Fusarium*, and *Leptosphaerulina*. Generally, we feel these fungi attack dead and dying plant material. They are easily "cleaned-up" with contact fungicides and close attention to the factors that caused the turf to stress. Moisture and temperature extremes, wear and tear, and nematode injury often lead to outbreaks of **senectopathic fungi**. Almost every soil sample sent to the laboratory for **nematode** analysis this summer has had populations above reported action thresholds. In some cases high nematode populations caused a decline in turf quality, in others, the turf appeared to be free of injury.

◆ Landscape

In landscape plantings this period, **mites** were the primary problem. Samples of junipers, spruce, and fir were diagnosed with mite problems. The samples were from Middlesex and Passaic counties. **Juniper scale** was identified on juniper from an Ocean County landscape and **woolly adelgid** was found on hemlock from Middlesex County.

A **canker** disease, caused by the fungus *Steganosporium acerinum*, was identified on maple branches brought to the laboratory by a Mercer County arborist. The fungus is thought to be an invader of dead wood, however, it was reported in the literature as a primary disease causing fungus in New Jersey. As with most cankers, we feel the fungus is attacking wood stressed by **drought** and **winter injury**. Remember, the effects of drought years 1993 and 1995 (not to forget the winters following each drought) will linger in landscape plants for many years and may manifest themselves as **canker** problems. ❑

RCE Plant Diagnostic Laboratory and Nematode Detection Service

A full service plant health diagnostic facility specializing in:

- ◆ Disease and Insect Pest Diagnoses
- ◆ Plant and Weed Identification
- ◆ Insect Identification
- ◆ Nematode Detection
- ◆ Turfgrass Endophyte Screening
- ◆ Fungicide Resistance Screening

For an accurate and timely diagnosis of your plant problem, forward plant material to the Rutgers Plant Diagnostic Laboratory and Nematode Detection Service. Submission forms and sampling information are available from your local county Cooperative Extension office, or write to:
Rutgers Cooperative Extension, Plant Diagnostic Laboratory, P.O. Box 550, Milltown, NJ 08850-0550

To have the forms automatically faxed to you 24 hours a day, call Rutgers Fax Info Line at (908) 932-6767 (call from phone, not handset of fax machine). Request documents #:

3601 - Plant Diagnostic Laboratory and Nematode Detection Service - information sheet
3602 - Plant Diagnostic Laboratory Form for Golf and Landscape Turf
3603 - Plant Diagnostic Laboratory Form for Home Grounds and Garden
3604 - Plant Diagnostic Lab Form for Commercial Growers (Nursery, Greenhouse, Field etc.)
3605 - Plant Diagnostic Laboratory Form for Plant and Weed Identification
3606 - Proper Sampling of Soil & Plant Tissue for Nematodes FS 757

Insects of Ornamentals

Deborah Smith-Fiola, Ocean County Agricultural Agent and Steven K. Rettke, Landscape IPM Program Associate

✔ **Whiteflies:** The three species commonly found within the landscape are the azalea, mulberry and maple whiteflies. The azalea and maple whiteflies feed only on the hosts which bear their names, while the mulberry species feed upon holly, mountain laurel, magnolia, maple and mulberry. Adults are white, 1/16 to 1/8 inch in length, and resemble tiny moths. When the plant is disturbed, large numbers of adults will fly up in a 'white cloud', before settling back down on the plant to feed. Nymph and pupae stages are flat and resemble scale insects. All stages feed on the underside of leaves. Heavy infestations may cause leaves to wilt, turn yellow and drop prematurely. Lower leaves first become covered with honeydew, followed by sooty mold. Numerous ants present on the foliage may also indicate a population of whitefly (they feed on the honeydew). Control is often not needed, as damage is often insignificant. Rake up and destroy fallen leaves. If necessary, spray the undersides of infested leaves with insecticidal soap or horticultural oil if sooty mold and damage is significant. Parasitoids and predators can often maintain these pests at reasonable levels.

✔ **Tuliptree Aphid:** This native insect feeds on tulip poplar, and occasionally on magnolia. . There are several generations per season and active aphids may be present much of the growing season. They overwinter as oval, black eggs on twigs. Look at the underside of leaves for the yellowish aphids, which are host-specific. High populations can produce copious amounts of honeydew and sooty mold, creating a major nuisance. Leaves may turn yellow, be reduced in size, and drop prematurely. If honeydew accumulations become a problem during the summer, use horticultural soaps or oils to conserve beneficials (parasitoids and predators alone may not be effective for total population control). Residual insecticides are justified when rapid controls are necessary. If the black eggs are present on twigs in the winter, a dormant oil spray is appropriate.

✔ **Fall Webworm:** A late season pest of mostly visual concern. This caterpillar feeds within silken webs encircling branches, twigs, and leaves of mulberry, ash, elm, linden, sweetgum, willow, walnut, hickory, oak, apple, and other fruit trees. They only feed inside the web, which they enlarge as they grow. Larvae may feed for a few weeks before webs become apparent. The webs become most obvious near the end of larvae feeding periods. The second generation is about to hatch now (the first generation was active in late June). The first generation is usually small, while the second generation may sometimes have outbreak populations. Control by monitoring and pruning out nests while small (pole pruners can be useful in this work). If necessary, young caterpillars are vulnerable to sprays of *Bacillus thuringiensis,* horticultural oils and insecticidal soaps if the web is first penetrated. There are many effective parasitoids and predators of the eggs and larvae of this pest.

✔ **White Prunicola Scale:** This armored scale is found predominately on members of the *Prunus* genus (flowering cherry, lilac, purple leaf plum). Male covers are 1/16 inch in length, are white and have a narrow, elongate shape. Female covers are 1/16 inch in diameter and are circular and white with yellow shed skins near the center. There may be 2 to 3 generations per year. Fertilized females overwinter on the bark of twigs and branches. Immature crawlers, which are out now, are small and salmon colored. Under heavy infestations, premature leaf-drop can occur followed by dieback of small, outer branches. Monitor and inspect for crawlers during the summer months using double-sided sticky tape. Control of this scale is difficult. Use horticultural oil to target the crawlers. It may sometimes be necessary to prune off heavily infested branches. The most reliable control may be to manually scrub off small patches of white scale covers on healthy branches of small trees.

✔ **Eastern Spruce Gall Adelgid:** This imported adelgid causes green, circular pineapple shaped galls at the base of new growth. The preferred host is the Norway spruce, but white, red and blue spruce are known to be affected. Galls are 3/4 to 1 inch long. They turn brown and open in late summer to release mature adelgids. Immatures overwinter on twigs at the base of buds. Only one generation occurs each year. If galls are numerous, eventual twig death can occur. With continued infestations this can be a serious pest over time.

Once green galls form in the spring, control sprays are useless. With light infestations, prune out galls by August and destroy. Sticky traps detect flying adults in late summer and early fall. Horticultural soaps or oils can suppress adults, eggs, and nymphs in early fall. Overwintering nymphs on terminals can be controlled with a dormant oil. (Note that some Norway spruce trees have a genetic immunity to gall formation from this adelgid. Therefore, it is possible to have two trees side by side with only one being affected with galls.) ❑

Twilight Nursery Meeting

Wednesday - August 27, 1997
5:00 p.m.

Sponsored by
Rutgers Cooperative Extension of
Gloucester County
in Cooperation with
A. Ferrucci and Son Nursery
North Brewster Road
Newfield, New Jersey

Program Agenda

5:00 p.m. Welcome and Introductions - Anthony Ferrucci, Jr., F. Ferrucci & Son and Jerome Frecon, Agricultural Agent, Rutgers Cooperative Extension

5:10 p.m. Start Tour of Nursery

Identification of weeds for the Pinelands and Nurseries by Dr. Richard Ilnicki, Professor of Weed Science, Emeritus, NJAES Rutgers University.

Weed Management and Control Suggestions for Nurseries by Dr. John Meade, retired Specialist in Weed Science (Professor Emeritus), Rutgers Cooperative Extension.

Nutrient Management in Field and Container Nursery Stock, by Dr. Raul Cabrera, Specialist in Nursery Management, Rutgers Cooperative Extension.

Case Studies in Pesticide Handing and Safety by Dr. Mark Robson, Executive Director, Environmental & Occupational Health and Safety Institute at Rutgers University.

Nursery Problems and Pesticide Safety by Jerome Frecon.

Tips on Controlling Weed in Nursery Irrigation Ponds by Dr. John Meade & Dr. Richard Ilnicki.

7:30 pm Adjourn

Pesticide Applicator Recertification Units will be given
This location is partially accessible to those with physical disabilities or handicap.
Please call for details or assistance (609) 863-0110

Landscape Seminar

A Professional Landscape Seminar is being offered at Skylands, the New Jersey Botanical Garden, on Wednesday, September 24, 1997. The co-sponsors of this workshop are Rutgers Cooperative Extension (RCE) of Bergen County, New Jersey Landscape Contractors Assoc., Skylands, and the Paramus Shade Tree Commission.

The workshop is designed for landscape contractors, landscape architects, parks directors, arborists, horticulturists, and Master Gardeners.

NJDEP credits will be awarded. For further information and registration materials, call Joel Flagler, RCE of Bergen County at (201) 599-6162. ❑

Diseases of Turfgrass

Bruce B. Clarke, Ph.D., Turfgrass Pathology

✔ **General: Basal stem rot anthracnose, brown patch,** and **yellow ring** continue to be reported. **Summer patch** is prevalent on annual bluegrass, Kentucky bluegrass and fine fescue species. **Anthracnose, dollar spot,** and **copper spot** are all apparent on golf and landscape turf at this time. Since the latter three diseases are stimulated by environmental and cultural stress, maintain optimum turf vigor to reduce disease severity (i.e., irrigate between midnight and 9 a.m. to avoid drought stress). Refer to recent issues of this newsletter for complete disease control information.

✔ **Fairy Ring:** This disease, caused by a group of fungi known as **basidiomycetes**, is starting to show up on golf greens and home lawns at this time. Symptoms typically appear as continuous or interrupted rings of dark-green turf. Mushrooms, which are often associated with this disease, usually develop only in the mid-spring and fall months. Although chemicals have been relatively ineffective against these fungi in the past, Prostar has shown promise in university tests. For now, maintain adequate fertility and soil moisture to mask symptom expression, and spike affected turf prior to irrigation to enhance water movement into the soil profile.

✔ **Marasmius:** There have been numerous recent reports regarding the appearance of small mushrooms protruding from brown leaf blades. These structures, belonging to the fungus *Marasmius*, are approximately 1/2 to 3/4 inch in length and consist of a dark brown stem and a small tan to orange colored cap. Although this fungus may appear pathogenic, it is actually invading dead and dying tissue and thus is not a threat to the surrounding turf.

✔ **Yellow Tuft:** This disease, caused by the fungus *Sclerophthora macrospora*, is present on greens and landscape turf at this time. **Yellow tuft** (=Downy Mildew) occurs on almost all cool season turfgrasses; however, it is usually only a serious problem on turf maintained at a low cutting height. Poorly drained and heavily irrigated sites are often associated with disease development. Infected turf appears stunted, off color (yellow to light green), and may exhibit slightly thickened or broadened leaf blades and a dense cluster of shoots. Patches range in size from 1/4 to 1 inch in diameter for bentgrass and red fescue turfs, and 1 to 3 inches for bluegrass and perennial ryegrass areas. Tufts are easily removed from the soil due to the absence of adventitious roots. Weeds and annual bluegrass may later fill in voids left by dead plants. To control, improve drainage, avoid over-watering, mow only when the grass is dry, apply iron sulfate to mask symptom expression, and spray turf with Aliette, Prodigy, or Subdue on a preventive basis (next spring) every 21 days from late March to early June. ❑

Insects of Turfgrass

Paula M. Shrewsbury, Ph.D., Ornamental and Turf Entomology

✔ **White grubs:** The **white grubs** that feed on turf roots are the immature stage of several species of scarab beetles which include **Japanese beetle**, **oriental beetle**, **masked chafer**, **green June beetle**, **European chafers,** and **black turfgrass ataenius**. At this time grubs are small (1st and 2nd instars) and at a stage when chemical controls will be most effective. *Monitoring* for **white grubs** should be done *now* to determine if control measures should be applied to prevent turf damage in September and October when grubs are bigger, eat more, and are more damaging. Monitoring should be focused in areas with the greatest probability of having grubs. For example, irrigated turf in sunny areas are more likely to have grubs than non-irrigated because eggs need moisture to hatch and beetles were laying eggs during a drought. Other areas include:

- irrigated turf around plants such as roses, lindens, or grapes (preferred hosts of Japanese beetle)
- turf with thick thatch layers or that have been fertilized with organic fertilizers (attracts green June beetles, chafers, and black turfgrass ataenius)
- turf areas under lights (attract night flying beetles)

Monitor the grub population by examining several square foot sections of turf. Cut 3 sides of the square foot area and lift the turf. Look for grubs in the root zone and top inch or two of soil. Grubs should be identified to species and assessed for any signs of beneficial organisms (insect-killing fungi, bacteria, or parasitoids) at work attacking the grub population. Another sampling method is to use a 4" golf course cup cutter. Multiply the average number of grubs per cutter sample by 10 to estimate the number of grubs per square foot. If your average grub density is above 10 to 15 grubs per square foot, control measures are warranted to prevent future damage. If grub populations are at damaging levels, chemical controls should be applied in the hot spots (areas with damaging grub populations). At this time of year, chemical controls include trichlorfon (Dylox), isazophos (Triumph), fonophos (Crusade), ethoprop (Mocap), bendiocarb (Turcam), or diazinon (not on golf courses or sod farms).

✔ **Annual Bluegrass weevil (*Hyperodes*): Annual bluegrass weevil** is a pest of short cut (less than 0.75") annual bluegrass. Young larvae feed within the plant and older larvae come out of the plant and feed on the crowns of the turf. This causes the turf to yellow, wilt, and turn straw colored. Damage first appears along the edges of fairways near woods or perimeters of greens and tees. You should be monitoring your short cut annual bluegrass around tees and greens for second

See Turf Insects on page 5

Weekly Weather Summary

Keith Arnesen, Agricultural Meteorologist

Temperatures averaged below normal. Extremes were 91 degrees at Pemberton, on the 10th and 47 degrees at Newton on the 8th. Weekly rainfall averaged 0.60 inches North, 0.55 inches Central, and 0.91 inches South. The heaviest 24 hour total was 1.94 inches at Hammonton on the 5th to 6th. Estimated soil moisture, in percent of field capacity, this past week averaged 73 percent North, 56 percent Central and 52 percent South. Four inch soil temperatures averaged 68 degrees North, 71 degrees Central and 73 degrees South.

Weather Summary for the Week Ending 8 a.m. Monday 8/11/97

	RAINFALL			TEMPERATURE				GDD BASE50		MON
WEATHER STATIONS	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	%FC
BELVIDERE BRIDGE	.64	18.70	-2.58	85	50	67.	-5	1637	-166	62
CANOE BROOK	.47	21.11	-1.28	89	53	72.	0	1971	167	63
CHARLOTTEBURG	.31	19.68	-2.91	87	48	67.	-3	1541	120	65
FLEMINGTON	1.34	21.07	-.57	87	50	68.	-5	1696	-155	75
LONG VALLEY	.48	21.10	-2.17	83	49	66.	-4	1506	-94	62
NEWTON	.38	17.21	-3.58	86	47	67.	-3	1405	-238	72
FREEHOLD	MISSING									
LONG BRANCH	.20	18.98	-2.09	88	57	71.	-3	1871	-28	31
NEW BRUNSWICK	.97	27.06	5.96	88	53	70.	-3	1885	-177	74
PEMBERTON	.69	19.10	-2.19	91	54	73.	-1	2130	111	42
TOMS RIVER	.25	18.48	-3.19	89	52	70.	-2	1900	8	32
TRENTON	.65	21.87	1.74	88	52	70.	-5	1865	-289	55
CAPE MAY COURT HOUSE	.71	15.95	-2.73	88	58	73.	-2	1984	-44	33
DOWNSTOWN	.58	17.40	-2.35	88	53	72.	-3	1993	-172	42
GLASSBORO	.09	20.30	-.42	89	57	73.	-2	2136	-2	31
HAMMONTON	2.02	18.70	-2.06	88	55	72.	-3	1977	-163	66
POMONA	1.25	21.45	2.54	87	57	71.	-2	1988	-9	58
SEABROOK	.05	18.87	-.14	89	56	73.	-2	2127	-45	30
ATLANTIC CITY MARINA	.82	18.90	.78	91	60	74.	0	1993	80	41
WOODSTOWN	.12	17.98	-2.77	90	50	72	NA	2152	NA	NA

WES KLINE — GDD BASE 40 PINEY HOLLOW

Last Week 247 (Ending 08/04/97)

This Week 226 (Ending 08/11/97)

TURF INSECTS FROM PAGE 4

generation larvae feeding near the crowns now. You can monitor for larvae visually or a more accurate method is to take several cup cutter cores and examine them. Break up the soil and thatch of the core and place it in warm water. Larvae should float to the surface in 5 to 10 minutes. If larval densities are high and damage is occurring, an application of isazophos (Triumph) or chlorpyrifos (Dursban) may be warranted. Only treat areas where populations are high and damage is occurring (hot spots). Control strategies should also include adequate irrigation, raising mowing height if possible, and reducing the amount of annual bluegrass in the turf.

✔ **Billbug** larvae are active at this time. **Billbugs** prefer highly maintained Kentucky bluegrass, but can also be a pest on perennial ryegrass, fescue, and tall fescue. Their feeding results in small, irregularly shaped brown patches (often mistaken for dollar spot disease) that pull up easily when tugged on. Young **billbug** larvae feed in the stem of the turf and control at this time is very difficult. However, currently the older **billbug** larvae have dropped out of the stems to the soil where they feed on the roots of the turf. Monitor for billbug damage by tugging on tufts of grass. Damaged turf will pull up easily and sawdust-like frass can be seen around the crowns and in the stems. Visually examine the base of plants at the thatch/soil interface and the top 4" of soil (use a cup cutter to sample) for the presence of larvae. Chemical controls for larvae include bendiocarb (Turcam), carbaryl (Sevin), imidacloprid (Merit - this is a systemic and must be applied early), bifenthrin (Talstar), disunion (not on golf courses or sod farms), ethoprop (Mocap), fonophos (Crusade), or isofenphos (Oftanol). Entomopathogenic nematodes (*Steinernema carpocapsae*) give good control and are commercially available. If infestations are not too high, damage may be masked with adequate irrigation and fertilization.

Remember to monitor for **chinch bug**, **sod webworm**, and **cutworm** activity and damage. These pests may be active throughout most of the season. However, damage usually is not noticed until now when pest populations are often higher (second generation) and turf is not actively growing and cannot tolerate as much injury. ❑